

In Seek of Climate change scenarios for California from CMIP5

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Ranking GCM's by Rupp and Mote

using a multi-factor historical climate evaluation scheme, SW US

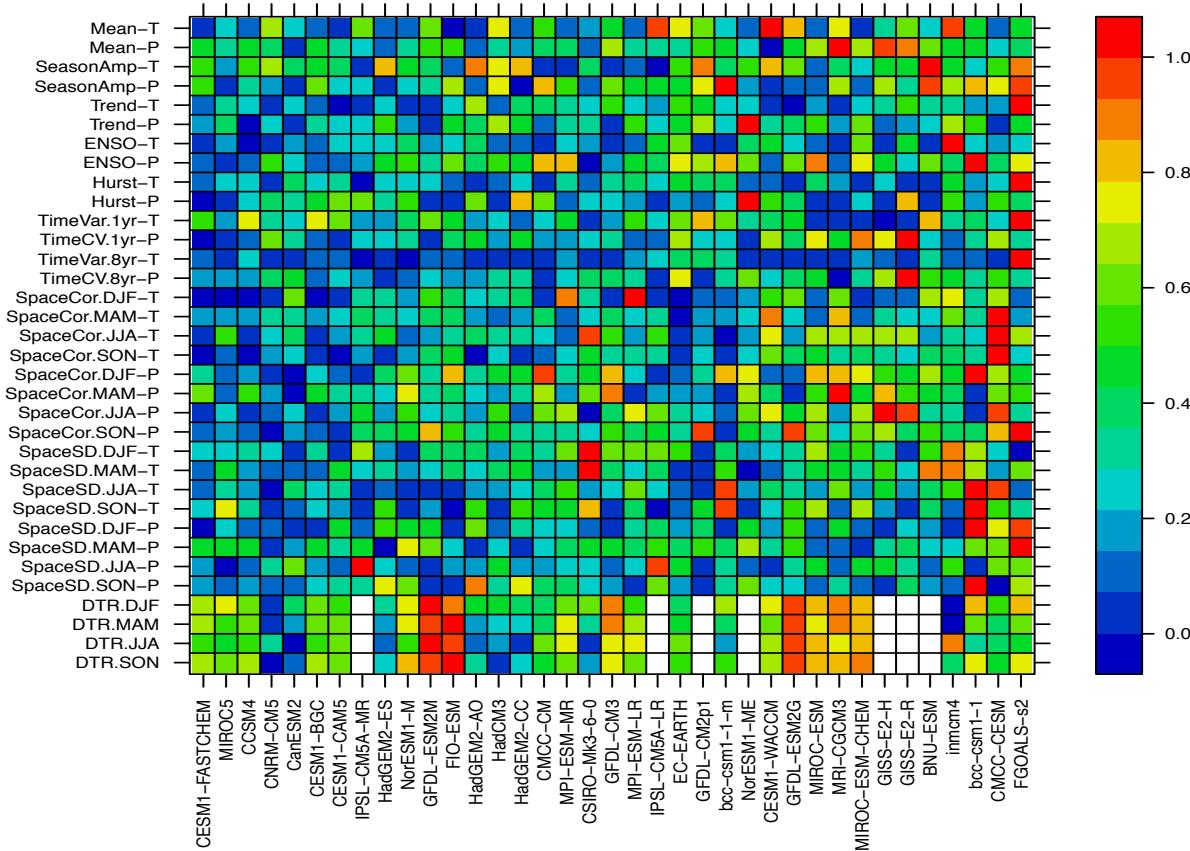


Figure 19. Relative error of the ensemble mean of each metric for each CMIP5 GCM. Models are ordered from least (left) to most (right) total relative error, where total relative error is the sum of relative errors from all metrics, excluding the diurnal temperature range (DTR) metrics. For 7 GCMs, the diurnal temperature range (DTR) metrics were not calculated (white squares).

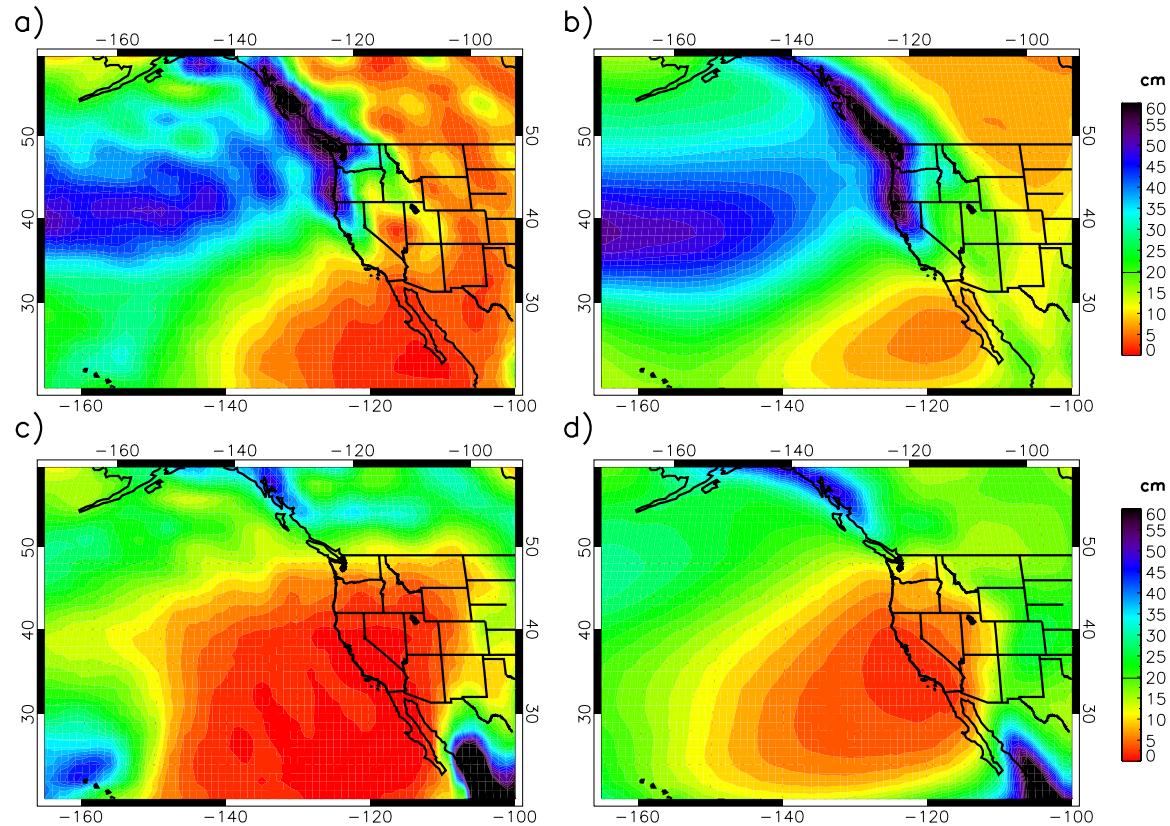


Figure 8. Mean precipitation for DJF (a and b) and JJA (c and d) from NCEP (a and c) and from the CMIP5 multi-model mean (b and d).

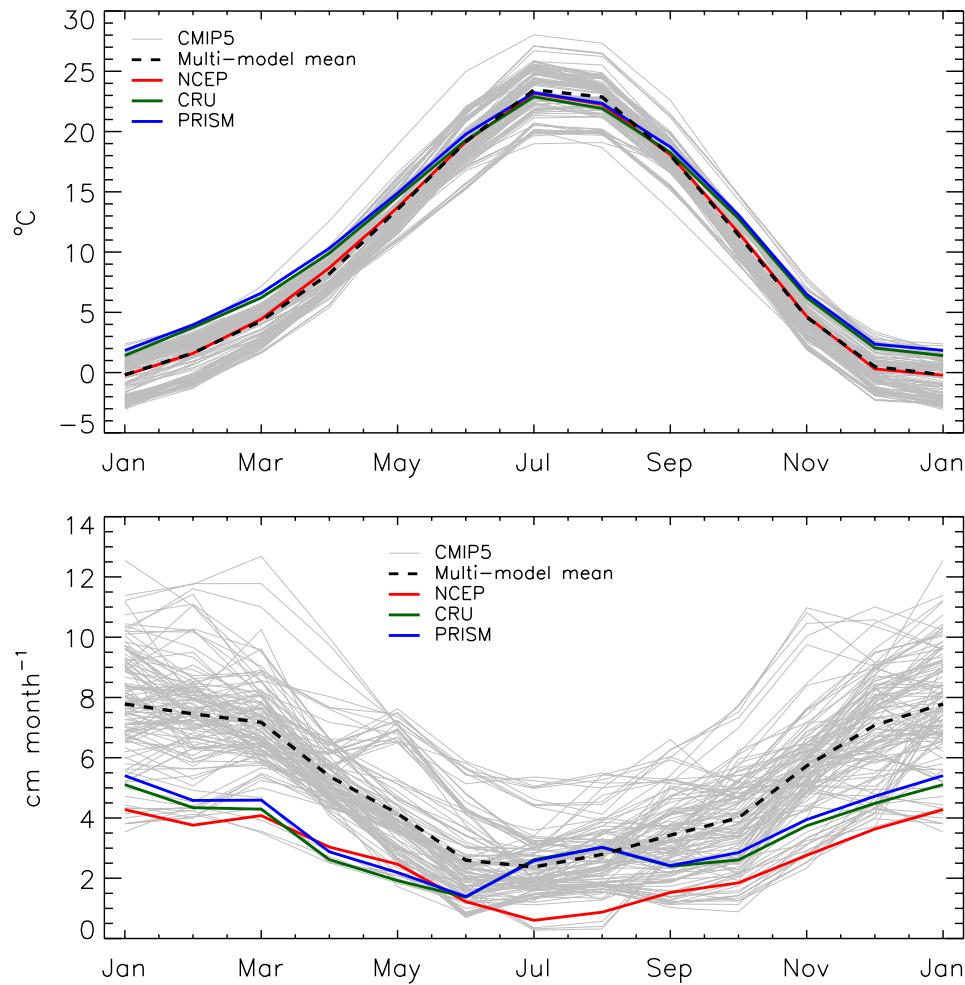


Figure 2. Mean seasonal cycle of temperature (upper panel) and precipitation rate (lower panel) averaged over the SWUS. Monthly means calculated from gridded observation datasets (NCEP, CRU, PRISM) and from all ensemble members from 37 CMIP5 GCMs.

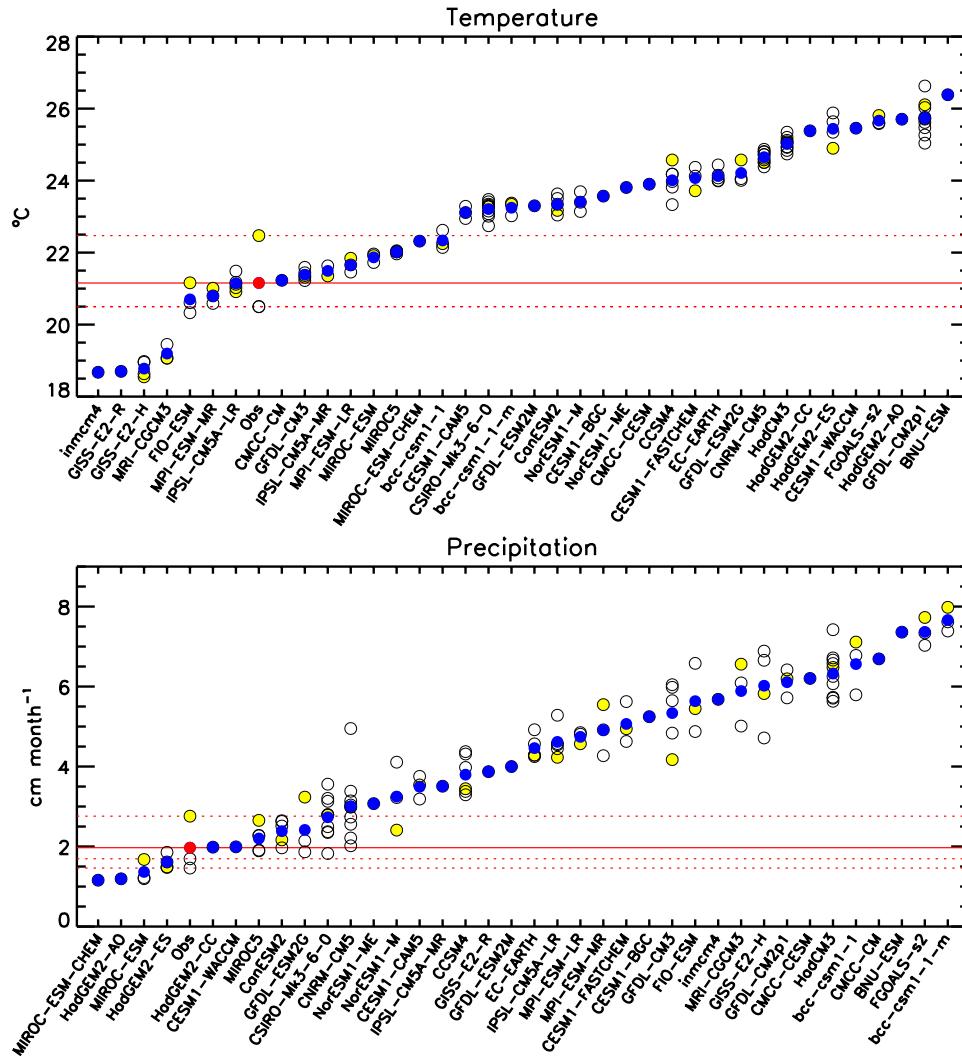


Figure 3. SWUS mean seasonal cycle amplitude in temperature and precipitation by model. For each CMIP5 model, blue-filled circles show the ensemble average, yellow-filled circles show the first ensemble member, and the open circles show the remaining ensemble members. For the observations (Obs), the red-filled circle shows the average, the yellow-filled circle shows NCEP, and the open circle shows CRU and PRISM.

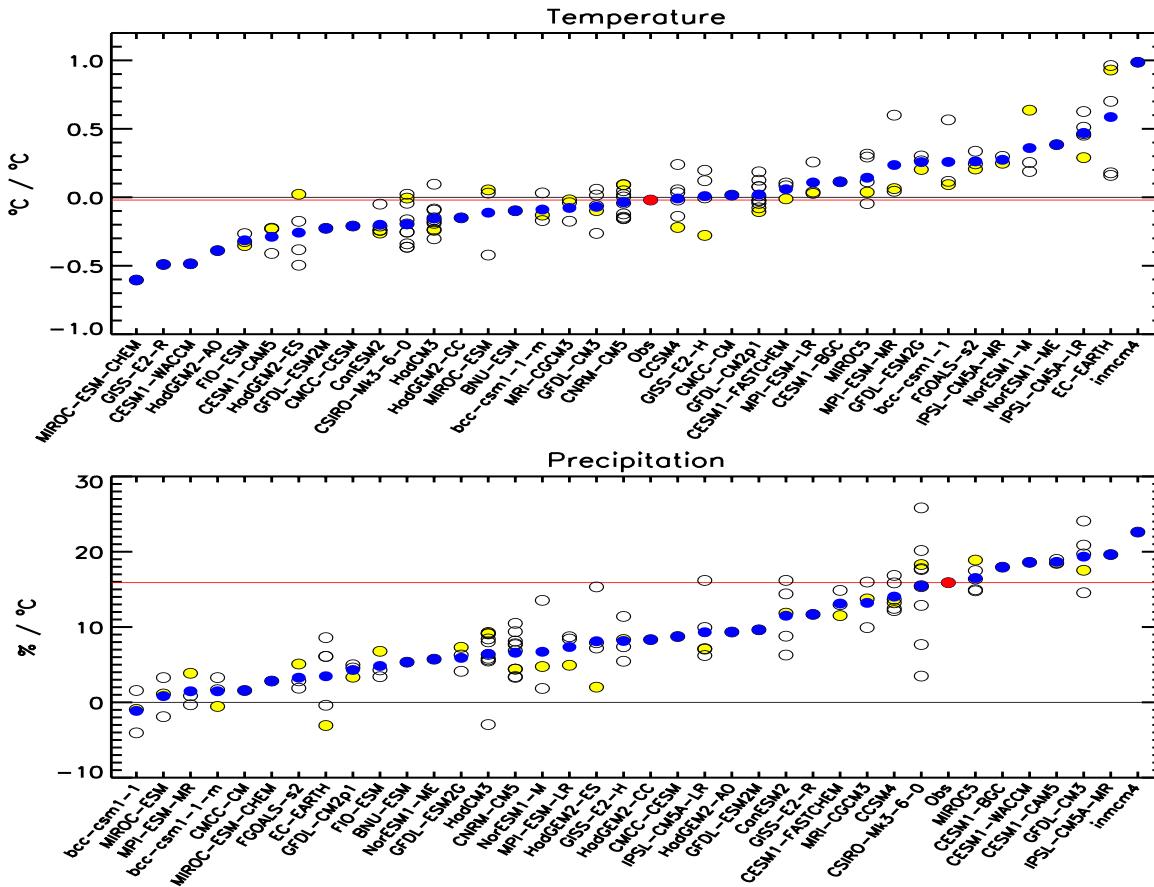


Figure 16. Response of SWUS winter (JFM) temperature and precipitation to the Niño3.4 index averaged over ASOND of the previous year. For each CMIP5 model, blue-filled circles show the ensemble average, yellow-filled circles show the first ensemble member, and the open circles show the remaining ensemble members. CRU was used for the observations (Obs).

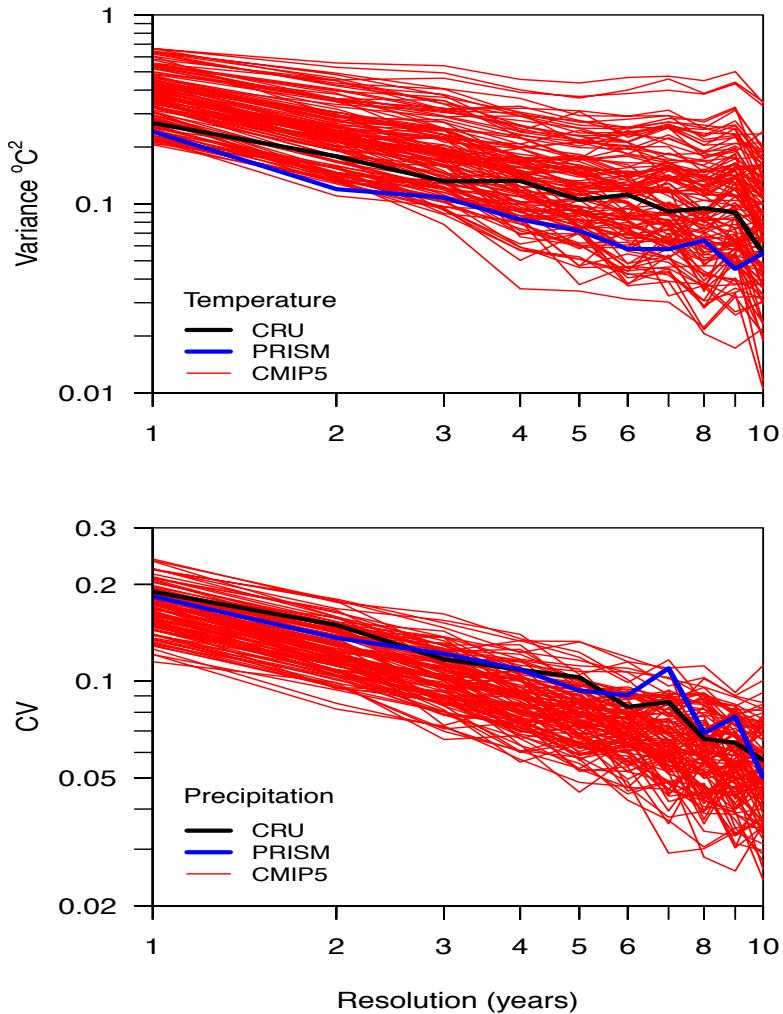


Figure 11. Variance of temperature anomalies (upper panel) and coefficient of variation of precipitation (lower panel) against temporal resolution for the SWUS-averaged time series.

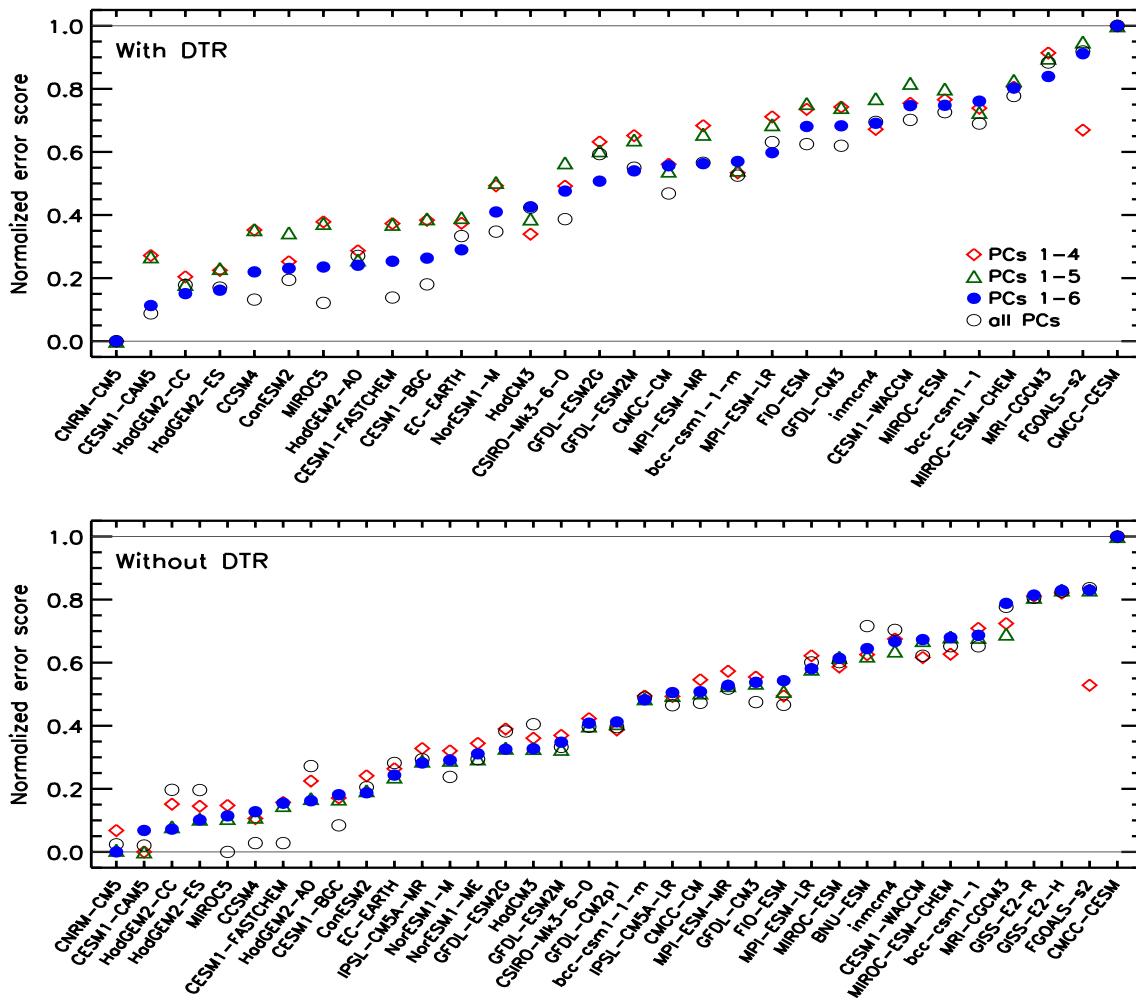
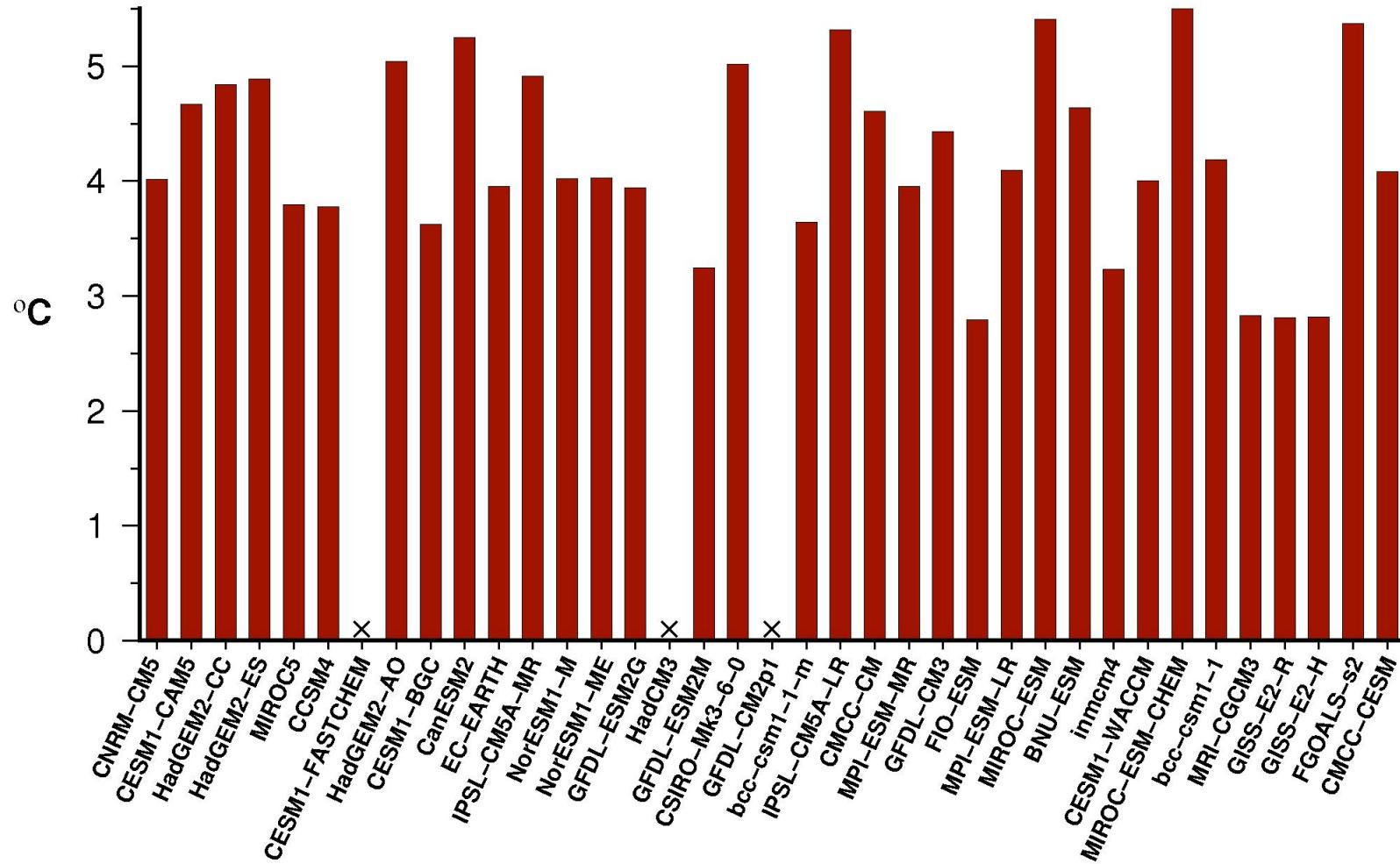
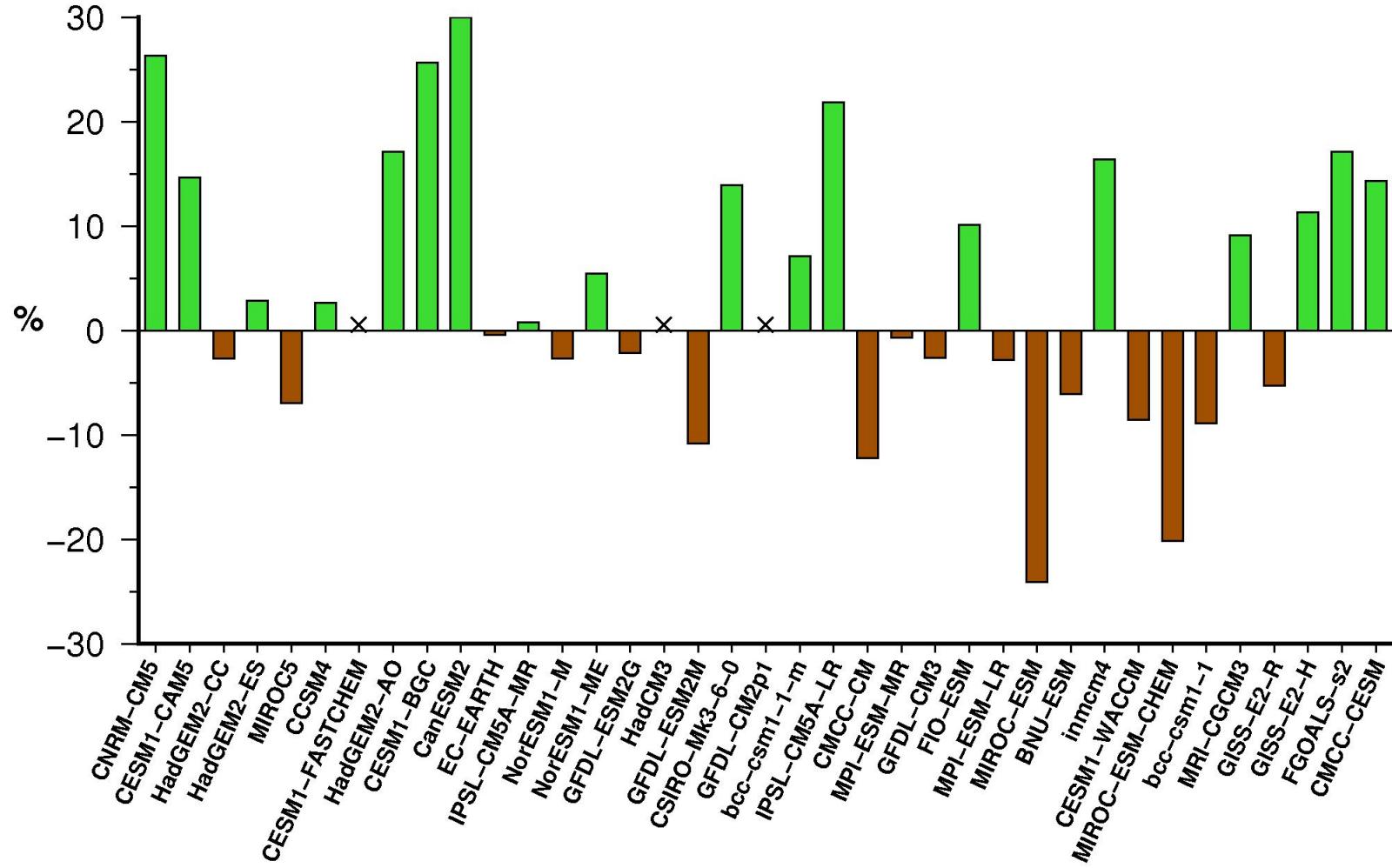


Figure 21. Models ranked according to normalized error score from EOF analysis of 18 (upper panel) and 16 (lower panel) performance metrics. The upper panel includes winter and summer mean diurnal temperature range (DTR), but 7 fewer GCMs. Ranking is based on the first 6 principle components (filled blue circles). The open symbols show the models' error scores using the first 4, 5, and all principle components (PCs). The best scoring model has a normalized error score of 0.

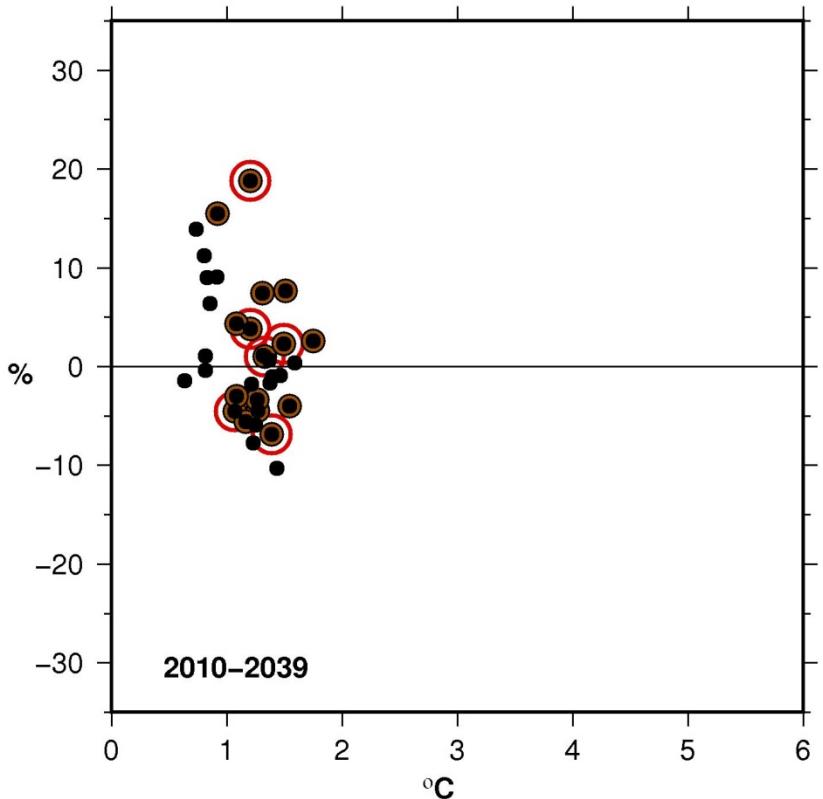
2070–2099 RCP8.5 annual temperature change: Sacramento from historical simulation 1970–1999



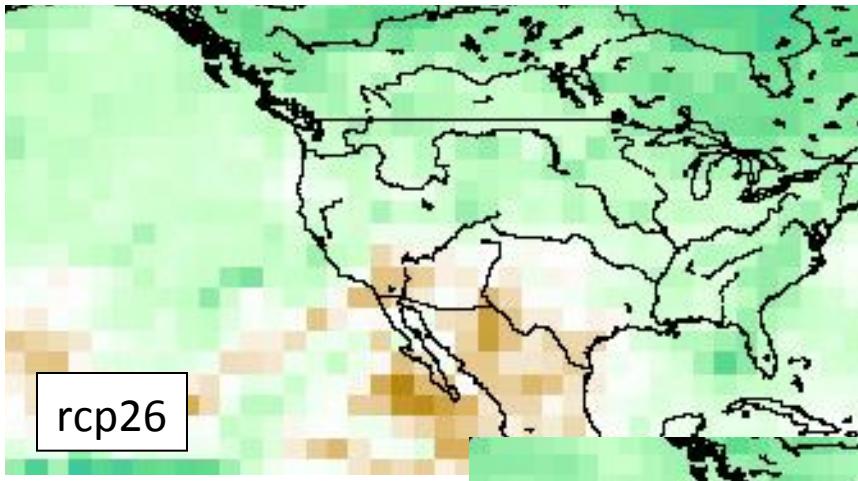
2070–2099 RCP8.5 wy precip % of historical: Sacramento historical simulation 1970–1999



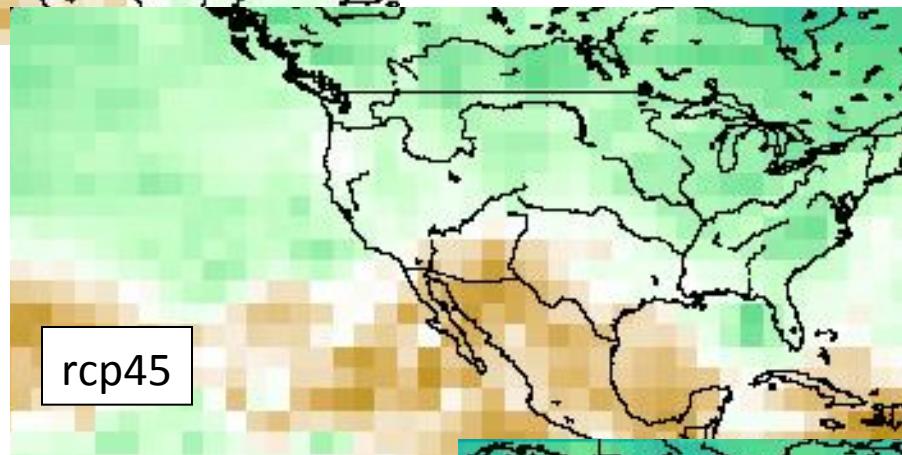
2010–2039 RCP8.5 Sacramento
 ann temp anom & wy precip % of hist
 historical simulation 1970–1999



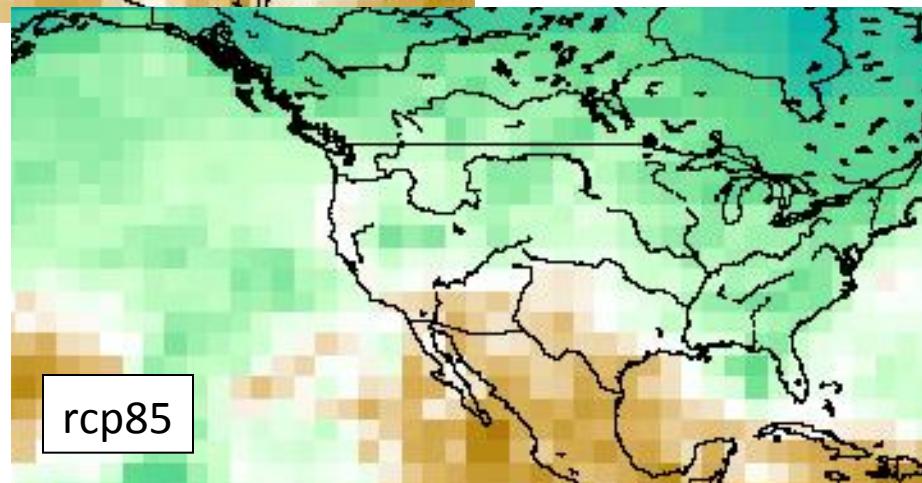
- Top 6: CNRM–CM5, CESM1–CAM5, HadGEM2–CC, HadGEM2–ES, MIROC5, CCSM4
- Top 16: Top 6 + HadGEM2–AO, CESM1–BGC, CanESM2, EC–EARTH, IPSL–CM5A–MR, NorESM1–M, NorESM1–ME, GFDL–ESM2G, GFDL–ESM2M, CSIRO–MK3–6–0
- Others: bcc–csm1–1–m, IPSL–CM5A–LR, CMCC–CM, MPI–ESM–MR, GFDL–CM3, FIO–ESM, MPI–ESM–LR, MIROC–ESM, BNU–ESM, inmcm4, CESM1–WACCM, MIROC–ESM–CHEM, bcc–csm1–1, MRI–CGCM3, GISS–E2–R, GISS–E2–H, FGOALS–s2, CMCC–CESM

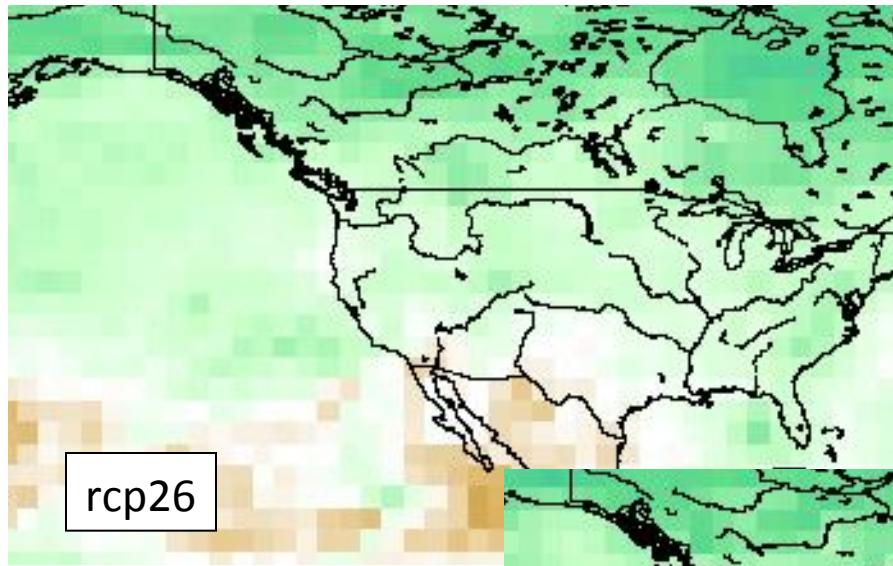


Mid century median change
2040-2069
16 cmip5 models

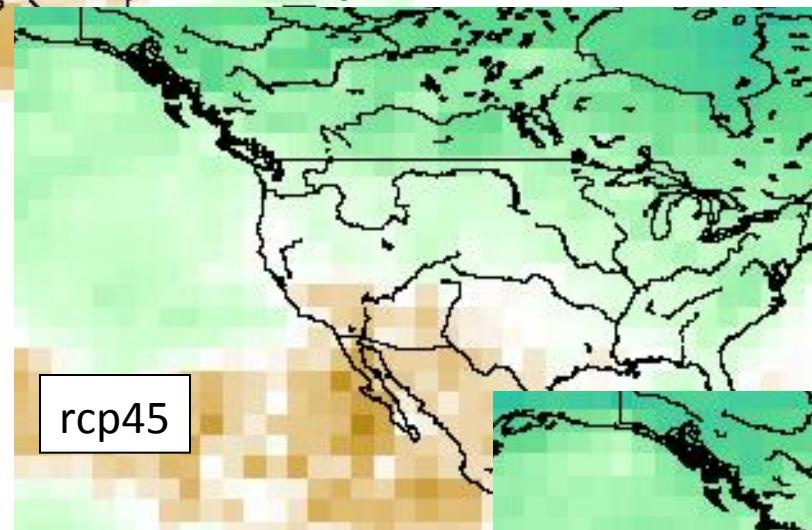


- Models:
- Noresm1m
 - Canesm2
 - Cnrmcm5
 - Csiromk3.6
 - Gfdlcm3
 - Gfdlesm2g
 - Gisse2r
 - Inmcm4
 - Mirocesm
 - Mpiesmlr
 - Mpiesmmr
 - Ccsm4
 - Cesm1cam5
 - Hadgem2ao
 - Mrcgcm3
 - Ipslc5alr

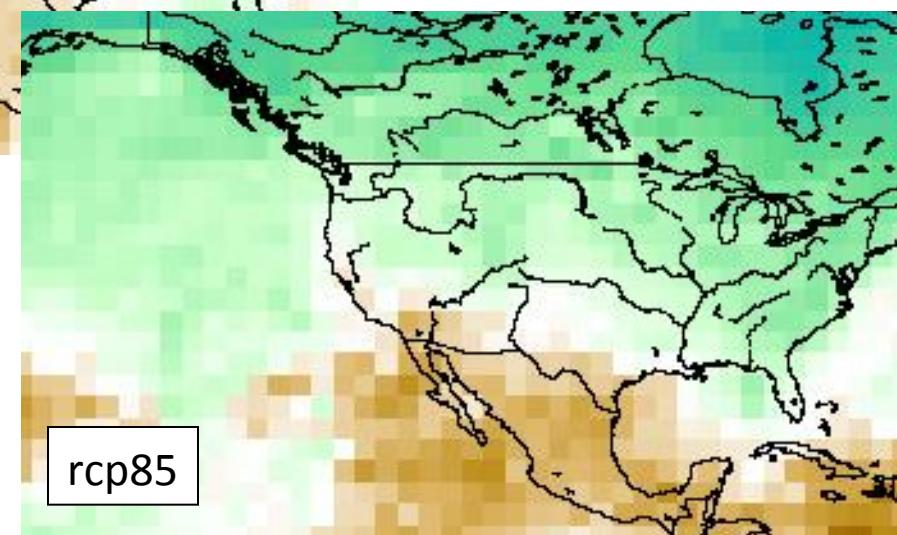




rcp26



rcp45



rcp85

Mid century median change
2037-2066
28 cmip5 models

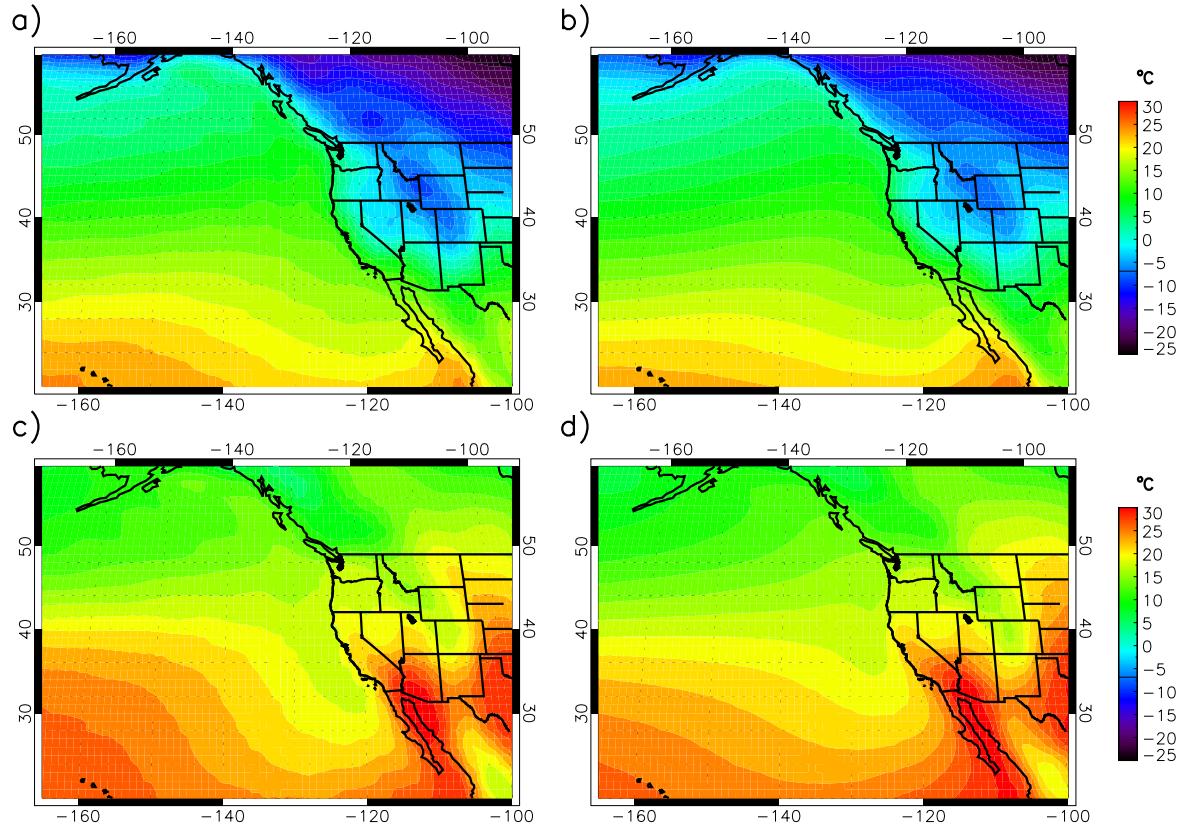


Figure 7. Mean temperature for DJF (a and b) and JJA (c and d) from NCEP (a and c) and from the CMIP5 multi-model mean (b and d).

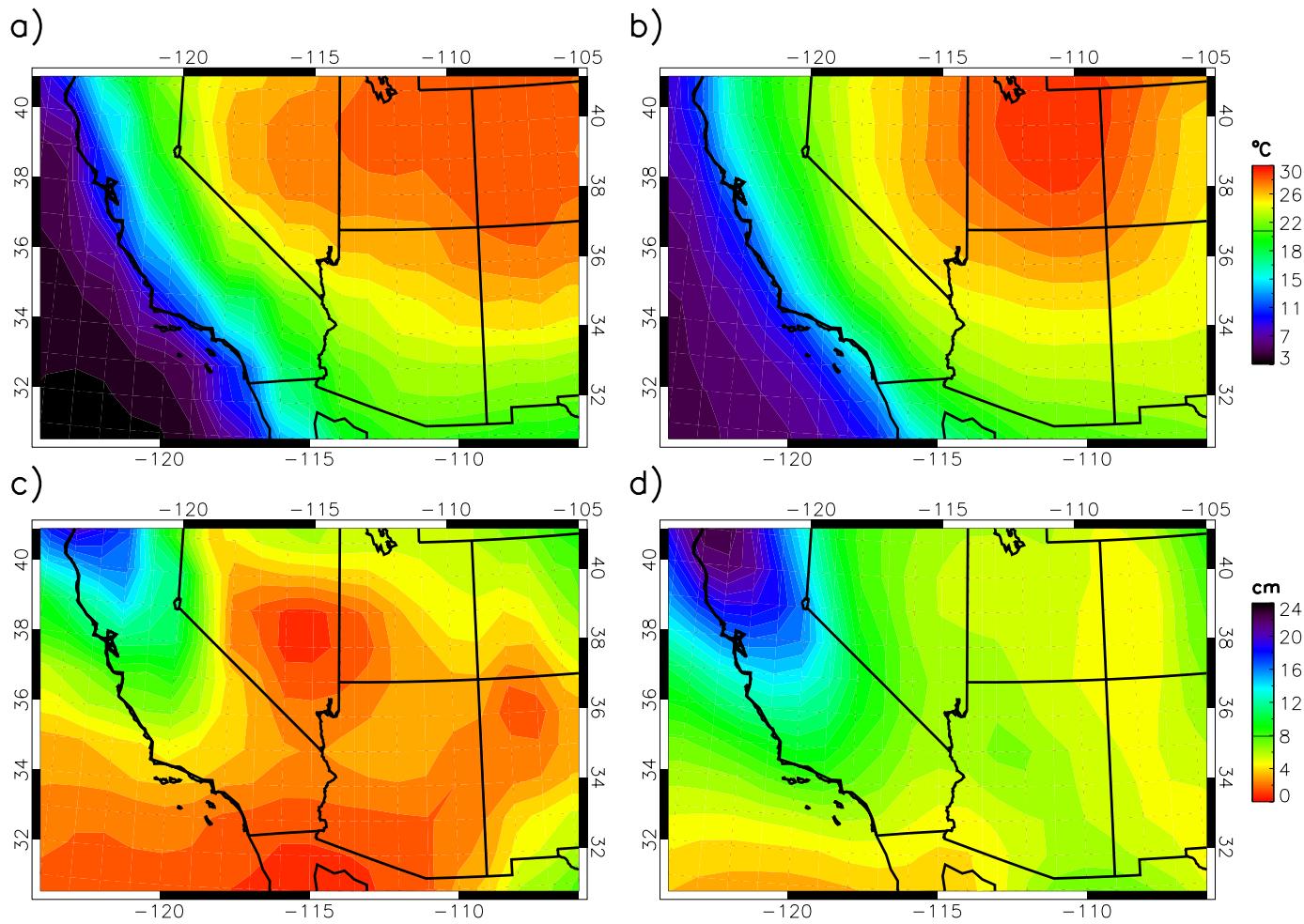


Figure 4. Mean seasonal amplitude for temperature (a and b) and precipitation (c and d) from NCEP (a and c) and from the CMIP5 multi-model mean (b and d). Note that the legends have been reversed between the upper and lower plots so that red implies a more extreme temperature cycle and blue implies a more extreme precipitation cycle.

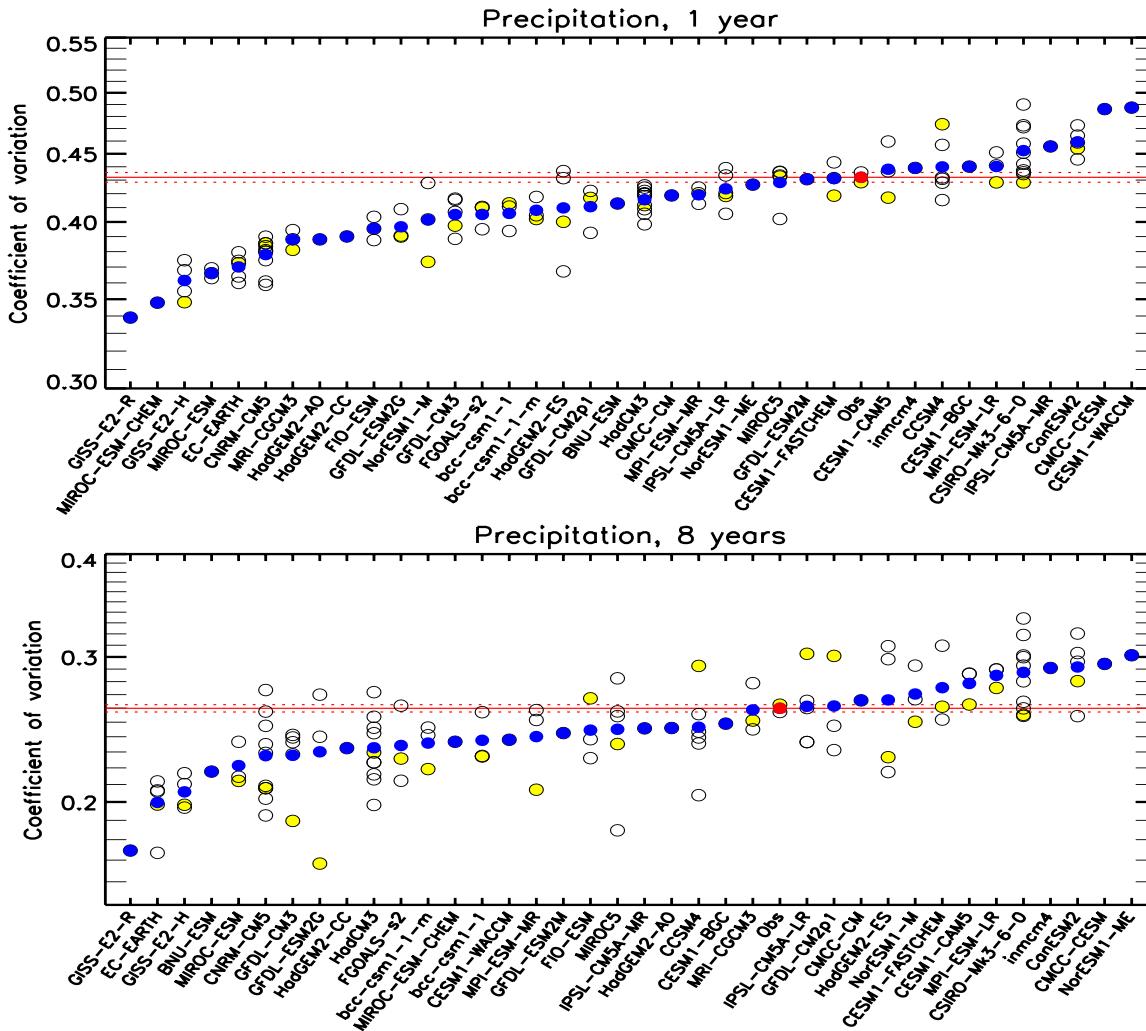
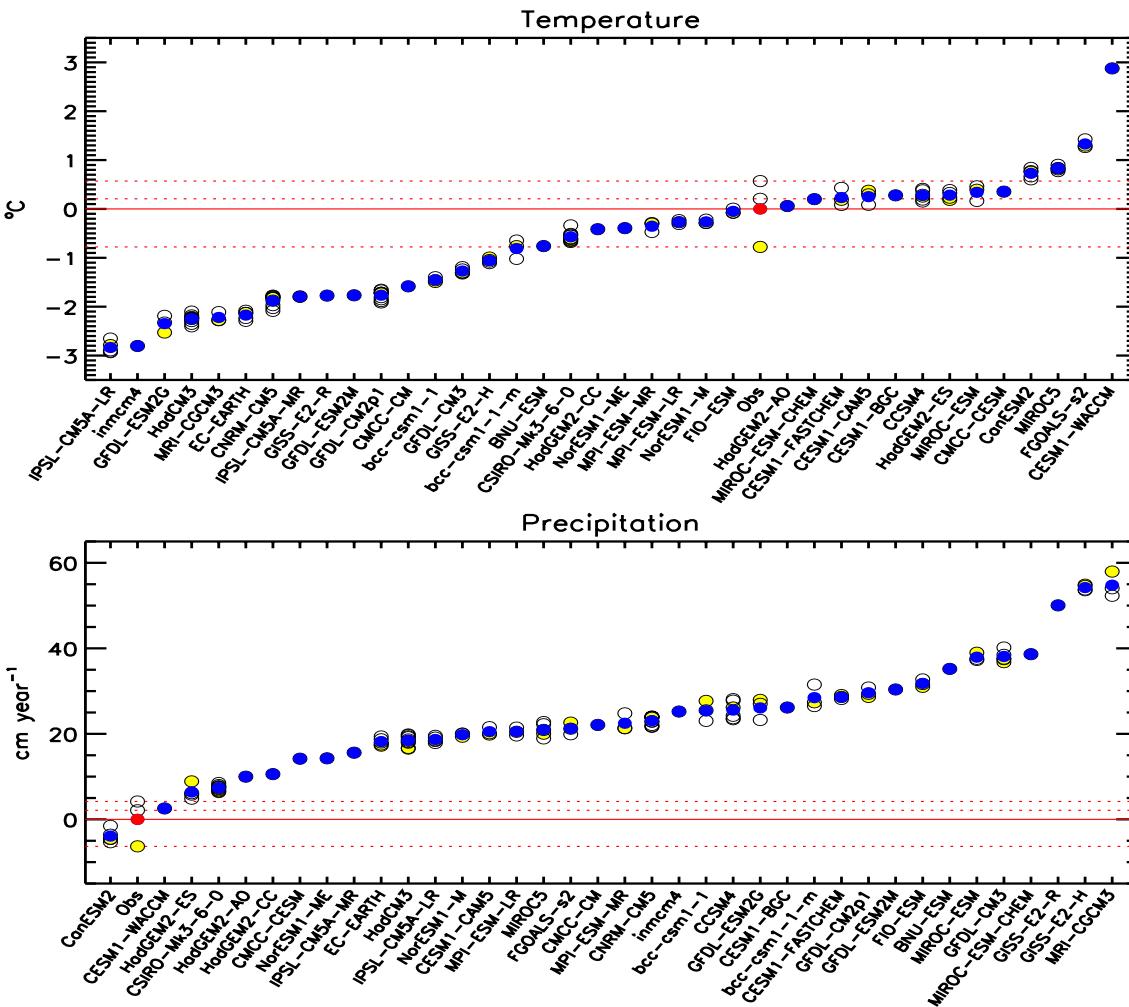


Figure 13. Coefficient of variation of precipitation at temporal resolutions of 1 year and 8 years for all CMIP5 simulations and observations. Values were averaged over the SWUS domain. For each model, blue-filled circles show the ensemble average, yellow-filled circles show the first ensemble member, and the open circles show the remaining ensemble members. For the observations (Obs), the yellow-filled circle shows PRISM, the open circle shows CRU, and the red-filled circle gives their average.



SWUS mean annual temperature and precipitation bias by model. For each CMIP5 model, blue-filled circles show the ensemble average, yellow-filled circles show the first ensemble member, and the open circles show the remaining ensemble members. For the observations (Obs), the red-filled circle shows the average, the yellow-filled circle shows NCEP, and the open circles show CRU and PRISM.

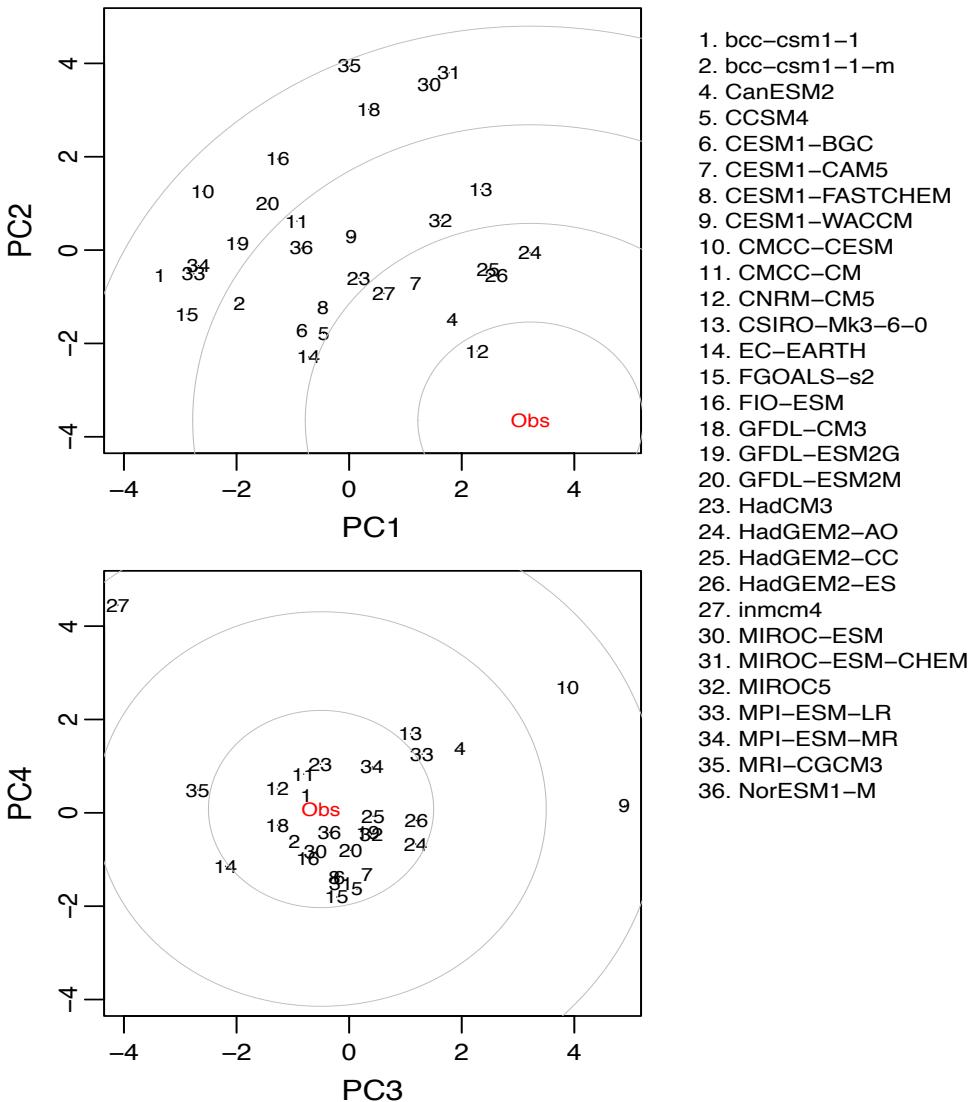
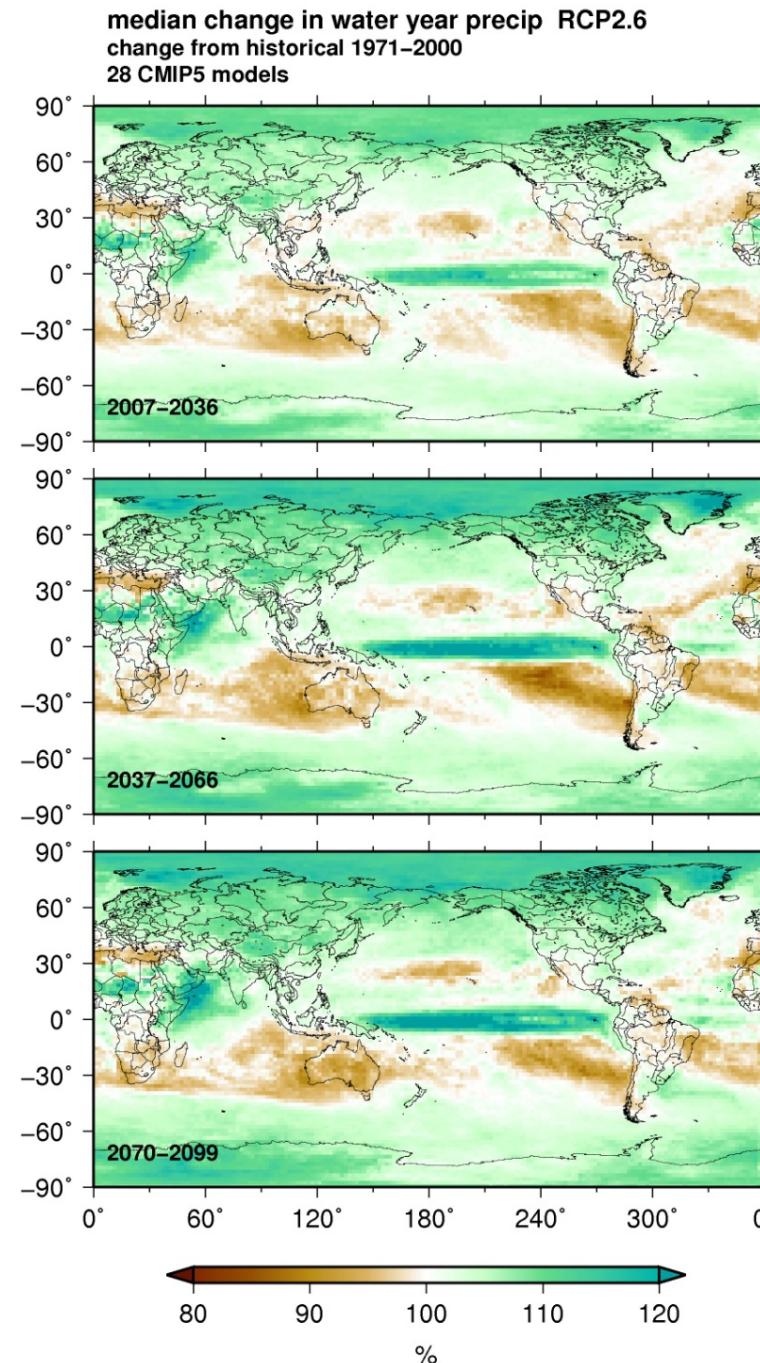
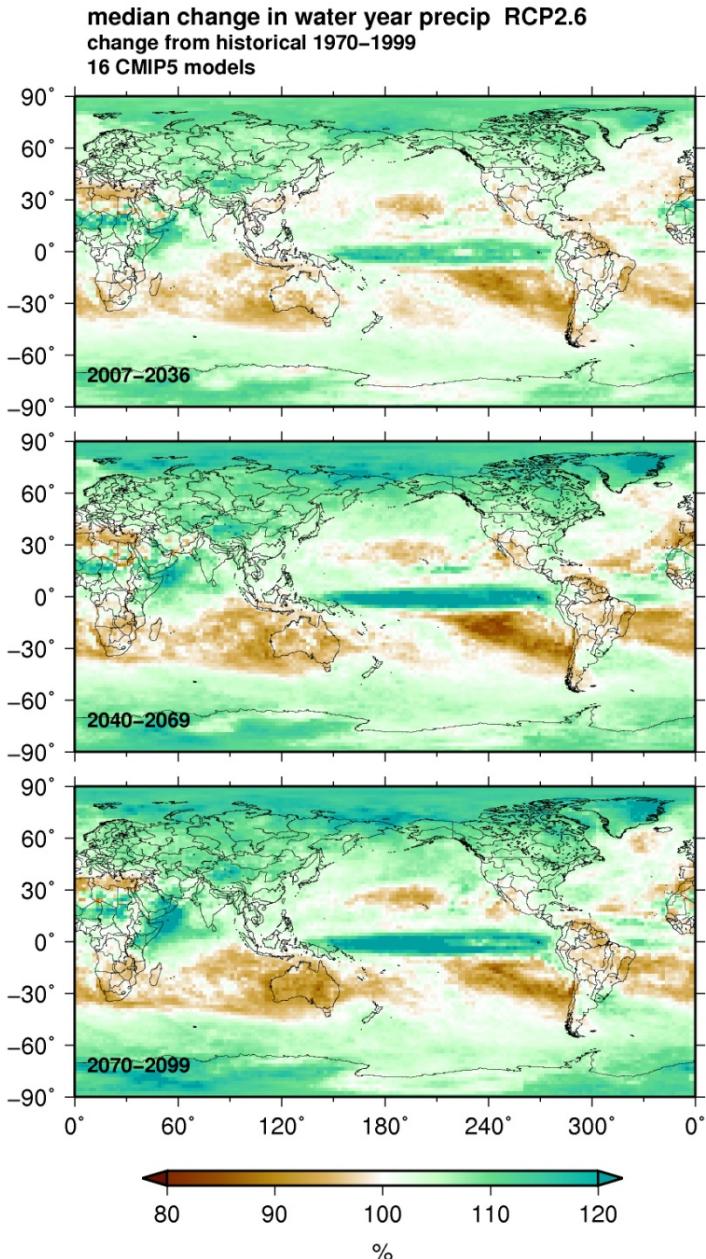
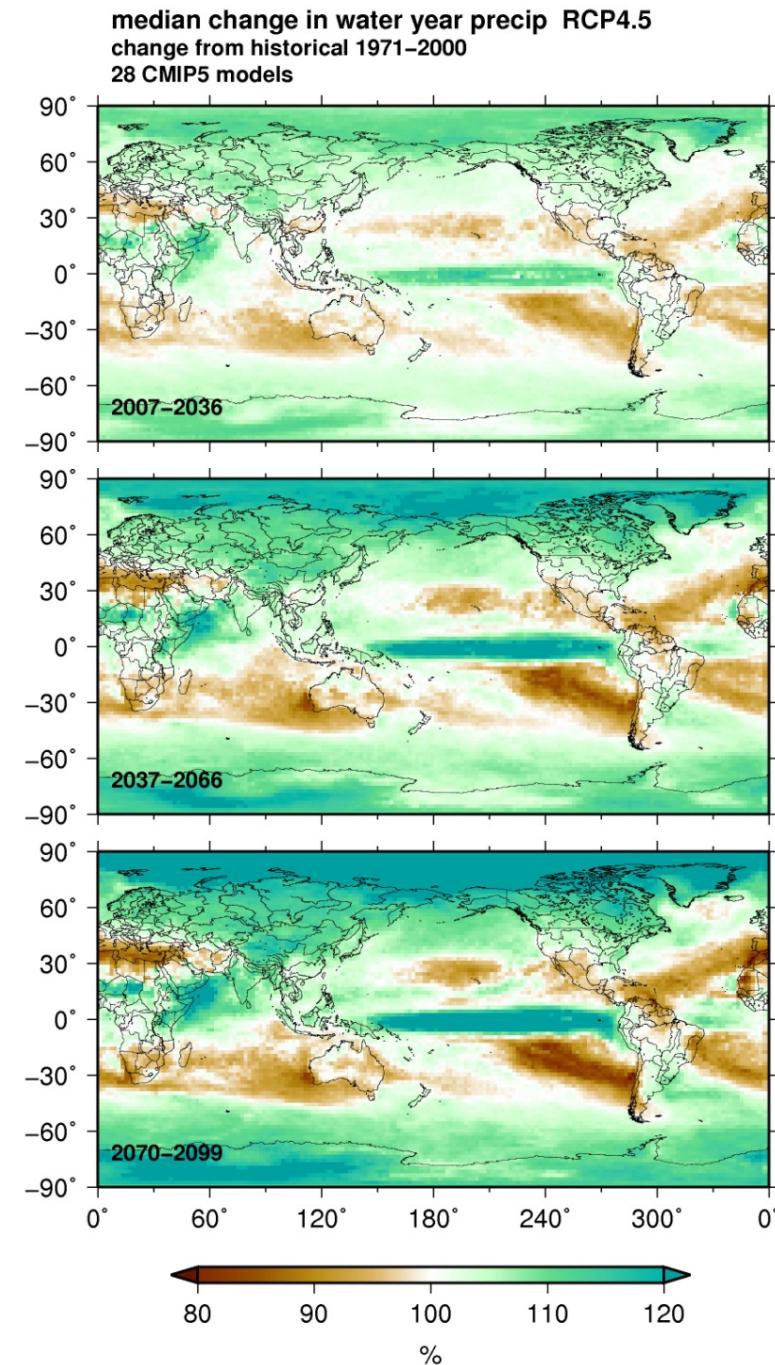
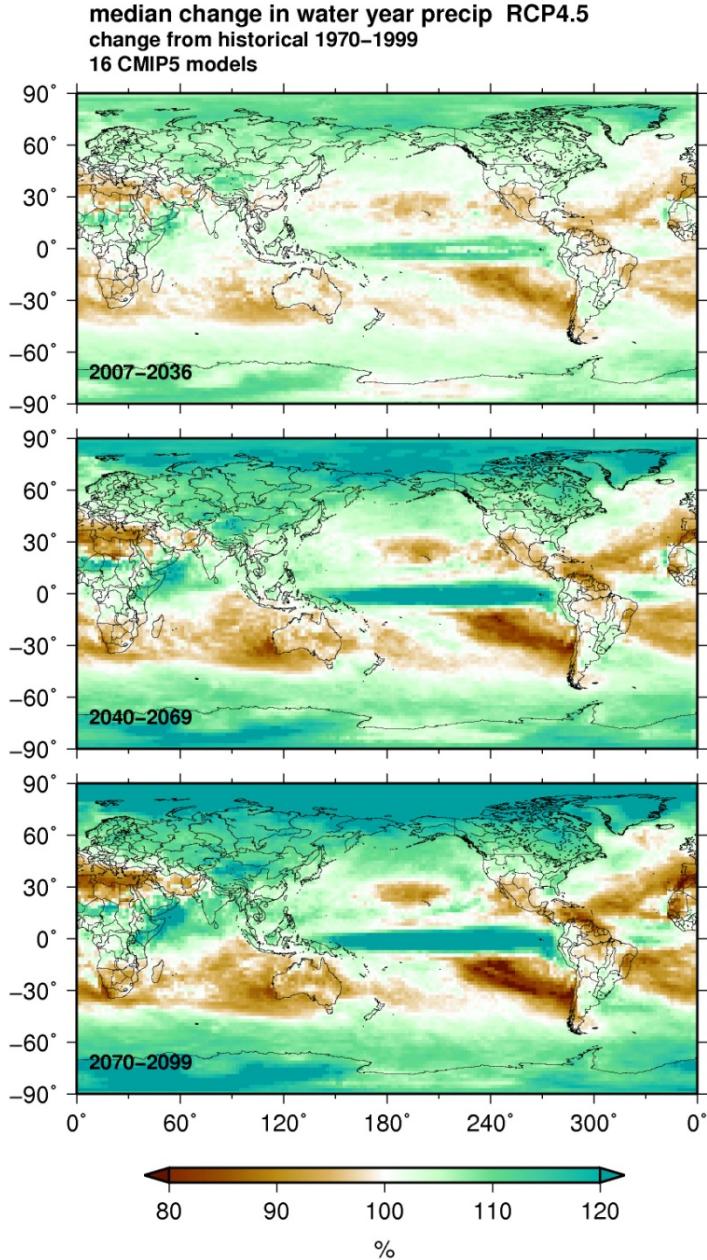
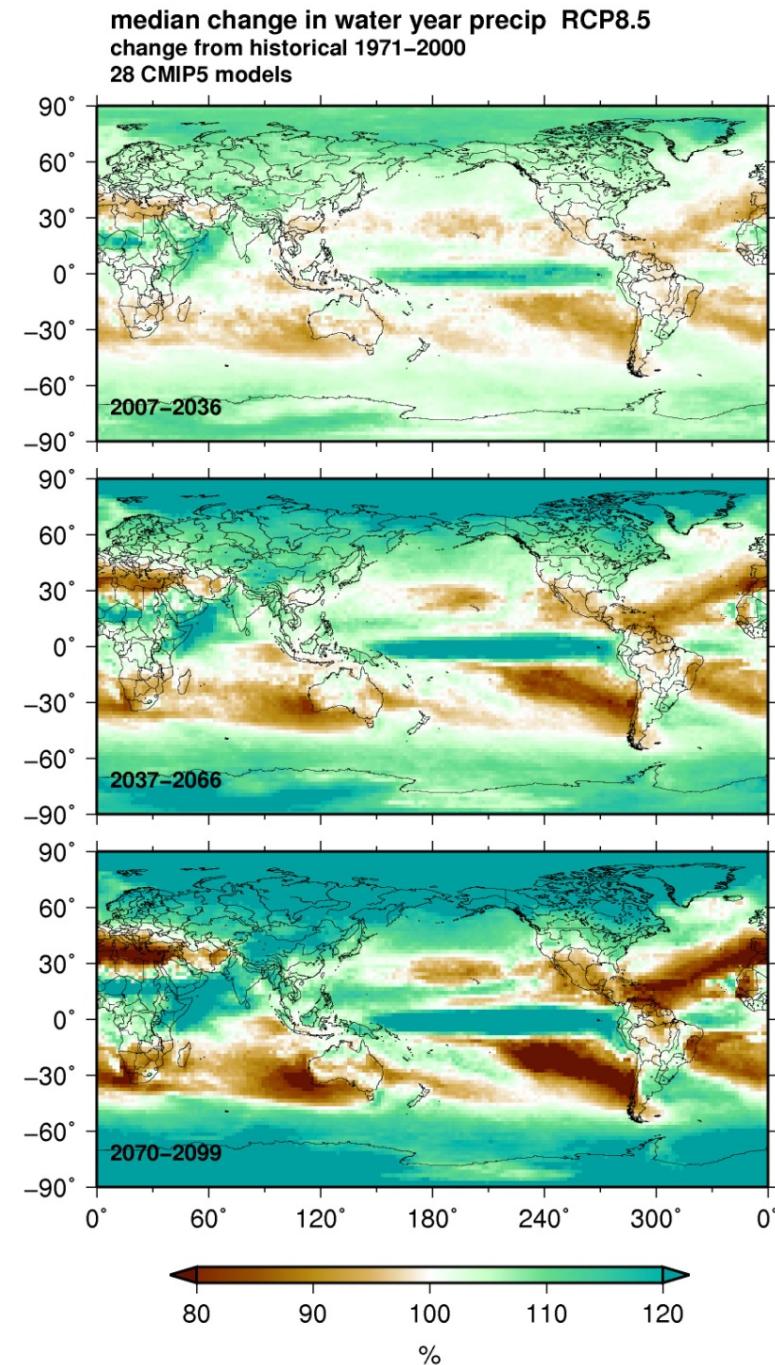
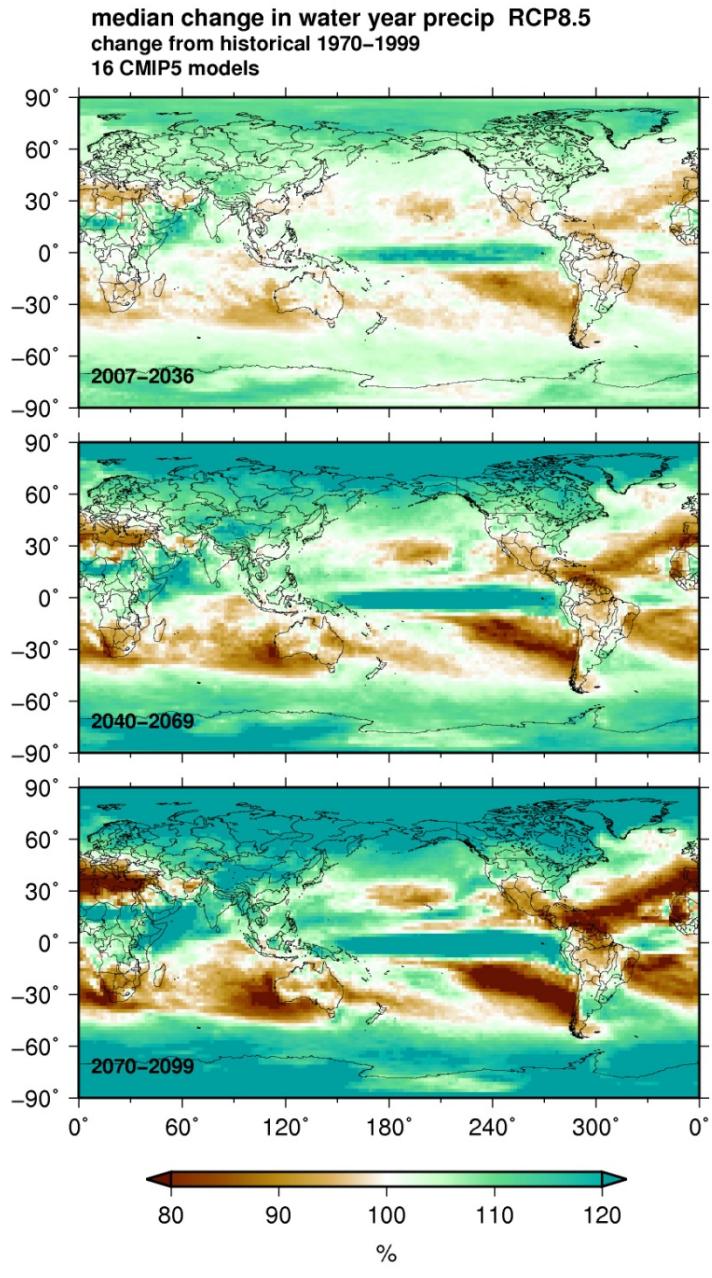
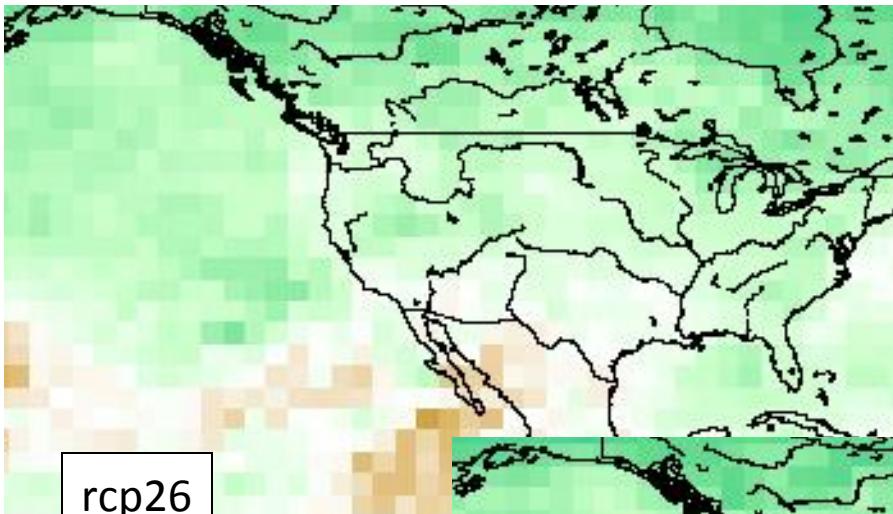


Figure 20. Loadings of the first four principle components (PC1, PC2, PC3, PC4) from EOF analysis of 18 evaluation metrics (includes diurnal temperature range) and 30 of the full 37 GCMs. “Obs” indicates the observation dataset.



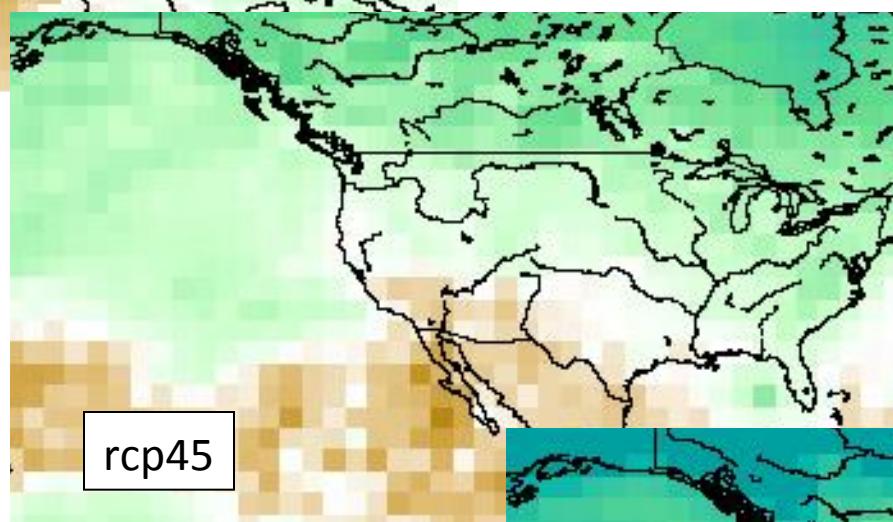




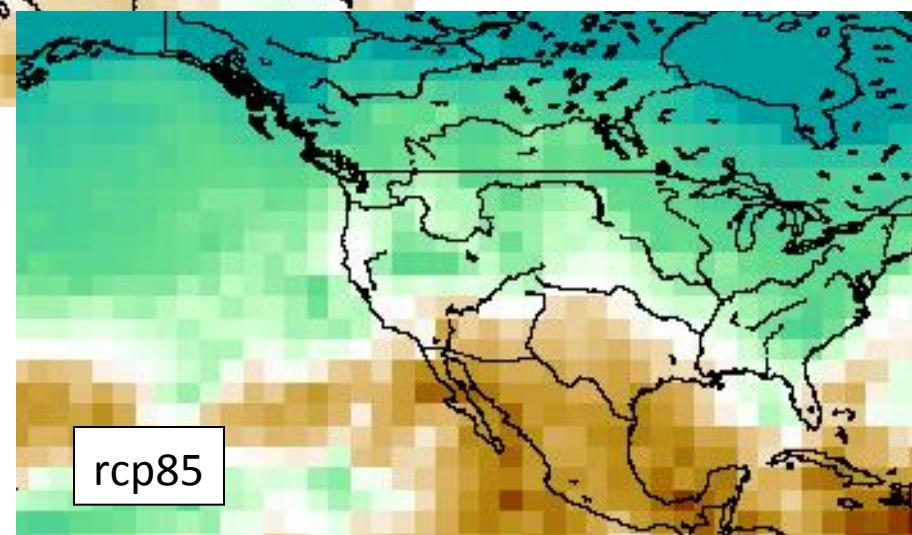


rcp26

Late century median change
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rcp45



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